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NSWC TR 79-174

COMPUTING TECHNOLOGY:
A SEMINAR FOR SENIOR EXECUTIVES

by

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JUNE 1979

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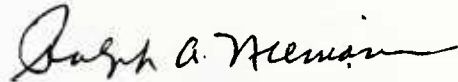
NAVAL SURFACE WEAPONS CENTER
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Paul L. Anderson, Capt., USN
Commander

FOREWORD

This document was compiled through the combined efforts of the authors, representatives of the Virginia Polytechnic Institute and State University (VPI&SU), the Applied Physics Laboratory/John Hopkins University (APL/JHU), and the Naval Surface Weapons Center (NSWC). This effort was funded by the Human Resources Development Division, NSWC.

Released by:

A handwritten signature in dark ink, appearing to read "Ralph A. Niemann". The signature is fluid and cursive, with a long horizontal stroke at the end.

RALPH A. NIEMANN, Head
Strategic Systems Department

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BACKGROUND

On May 1, 1977, in a visit to the Department of Computer Science at VPI&SU, Mr. James Colvard and Captain (now Rear Admiral) C. J. Rorie expressed the need for providing a computing technology update for senior executives at NSWC. In their discussion with Professor Richard E. Nance, the update was described as a method for providing an understanding of current technology in the computing field.

In a subsequent meeting of Mr. David Colby, Mr. Walter Warner, and Professor Nance, the technology update was specified more narrowly as a means for enabling senior persons (at the department head level or above) to

1. Improve their perceptions of the current state and the future trends in computing technology
2. Gain an appreciation of the requirements and difficulties of the software creation task
3. Better understand the necessity for evaluation, measurement, and control; and to recognize those techniques that are applicable to software as well as hardware
4. Increase their knowledge of the regulatory environment in which the acquisition of computing goods and services must be accomplished

Within this specification, several important topical areas were considered essential; e.g., the relationship between microprocessors and large mainframe systems, the embedded computer system concept, and the effect of decentralization of processing capability. Importance was attached to the tactical nature of NSWC projects and the increasing diversity of computing support that is required by NSWC in fulfilling its mission.

The seminar specifications were developed in a series of meetings beginning on May 25, 1978, which involved Dr. John Manley (APL/JHU), Mr. Walter Warner (NSWC), and Professor Richard Nance (VPI&SU). Mr. Colvard took part in the meeting of August 30, and offered several suggestions as to the seminar format and content. Ms. Mary Burrell (NSWC Training Office) attended the meeting of September 28, when the location and contracting arrangements were taking form.

SEMINAR GOAL

The goal of the seminar is to provide a tutorial on information processing as it relates to senior executive responsibilities in accomplishing the mission of NSWC. These responsibilities, ultimately related to the production of military tactical and support systems, extend into both the technical and administrative domains (Figure 1).

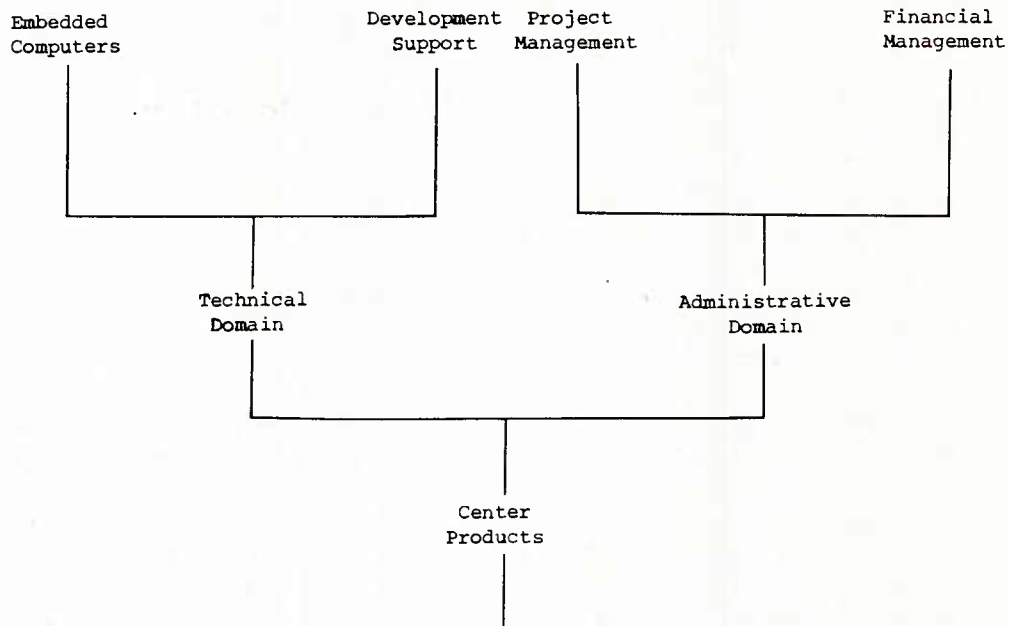


Figure 1. Resource Categorization for NSWC Products

To achieve the described goal, the seminar must enable the participants to (1) understand what is meant by *information processing*, (2) comprehend the current state of significant areas as they have evolved, (3) grasp the implications of past developments and potential future trends, and (4) relate this knowledge to their particular areas of responsibility.

PRESENTING TECHNICAL MATERIAL TO SENIOR EXECUTIVES

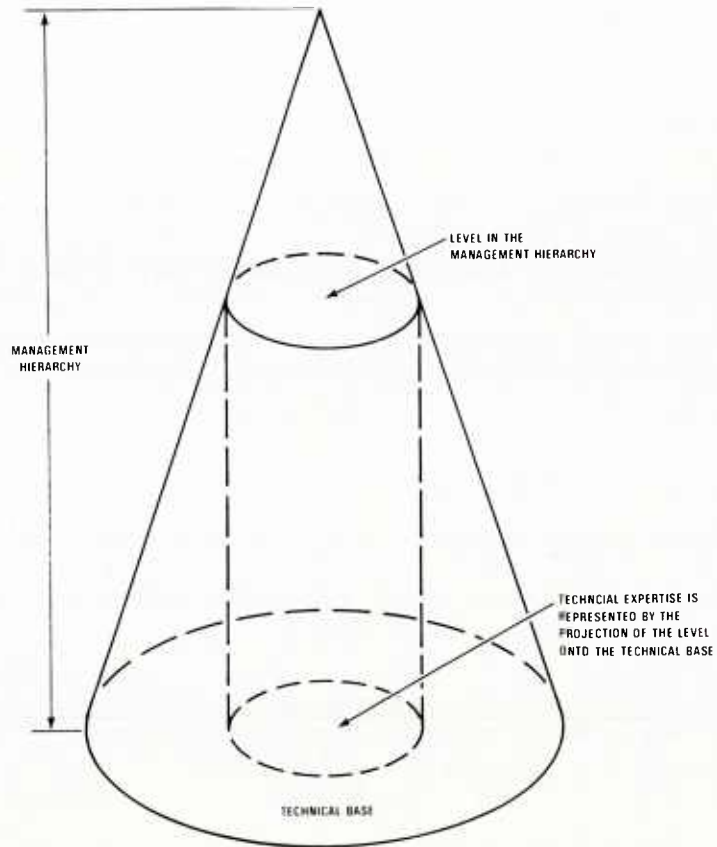
The management of an organization dependent on high technology products and employing highly skilled technical personnel requires an effective blending of technical and management skills. A seminar designed to teach technical material solely for the participants to gain technical knowledge is inappropriate. The approach should focus on the participants' roles as former technical persons who must now manage technical personnel and high technology projects from a distance. Despite the technical nature of the material, the content and presentation format is planned to benefit all senior executives.

CONICAL MODEL

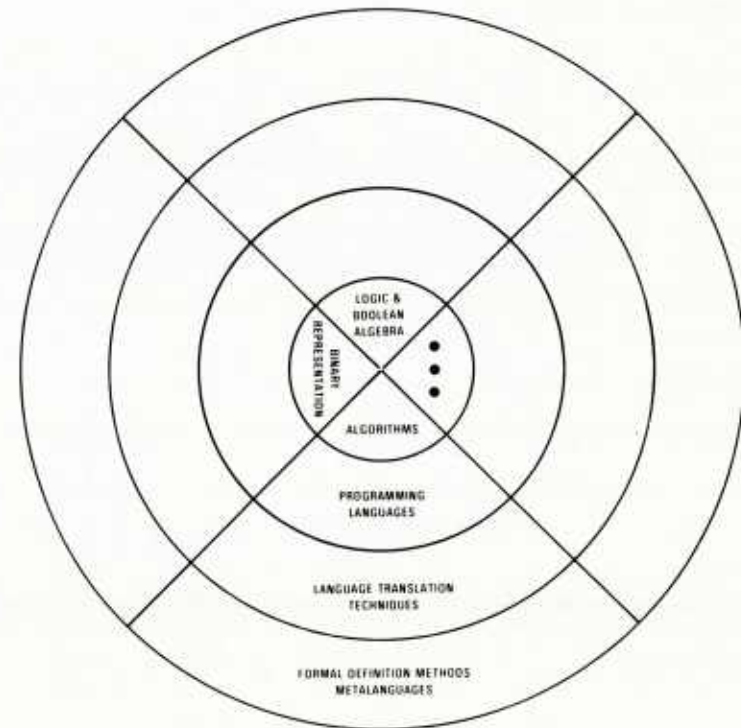
A simple illustrative model (Figure 2) helps to maintain the proper focus on the management/technical roles. Consider that any high technology organization can be represented as a cone with its base forming the technical foundation [Figure 2(a)]. At the center of the base is the most fundamental technical knowledge, and the specificity and recency of knowledge increases with the distance from the center. The base can also be partitioned into subareas of technical knowledge.

Levels of management superimposed on the technical knowledge base form a conical superstructure, such that the required technical knowledge at each level can be pictured as the projection of the conical cross section onto the base. The conical model expresses the intuitive perception that a manager's required technical expertise must diminish as the level of that individual's management responsibility increases. Further, the conical model offers interesting insights regarding the nature of the technical knowledge (the diameter of the base) and the expectations of technical currency for management (the altitude of the cone). We do not speculate on these insights at this point.

The conical model appears to offer the capability for representing the effects of technology shifts on an organization, and can perhaps be used as a tool for studying organizational dynamics. However, the purpose of the model in this context is to assist in drawing the boundaries for the technical presentations and in selecting among the many identifiable important subareas. The model also serves qualitatively as a reminder to maintain reasonable objectives and expectations.



(a) THE PROJECTION REFLECTS DECREASING TECHNICAL EXPERTISE WITH INCREASING MANAGEMENT RESPONSIBILITY



(b) THE CONCENTRIC REPRESENTATION OF SPECIFICITY AND THE WEDGE SHAPED PARTITIONING OF DISCIPLINE SUB AREAS

NOTE
COMPUTER SCIENCE AND THE SUBDISCIPLINARY AREA OF PROGRAMMING LANGUAGES SERVE ONLY AS EXAMPLES

Figure 2. Conical Model

PARTICIPANT PROFILE

The group of senior executives is defined to include all persons at the department head level and above; therefore, the number of participants (NSWC) is approximately 20. Of these, approximately two-thirds will have technical academic and/or experiential backgrounds. Most nonmilitary senior executives have at least 10 years experience at NSWC. This is not necessarily true of the military personnel, who are likely to have been at NSWC for less than two years and have served at a number of other installations quite different from the Center. Because of the intentional rotational policy of NSWC, most participants will have some knowledge of more than one department. Biographical sketches of most participants are included in Appendix A, and the addresses of seminar personnel are given in Appendix B.

The participants are expected to be stimulated by an interactive instructional format. Senior executives are not conditioned to a traditional *lecture* format, and their success has not been achieved through scholarly introversion. The group must be provided the vehicle for *give and take* in order to be motivated. Furthermore, the quality of these individuals suggests that such interaction is conducive, if not essential, to the success of the seminar.

Because of the variety of backgrounds in computing technology, a pre-course assessment is planned. This assessment will be conducted as a self-evaluation so as to alert a participant to topical areas in which more, or less, attention is likely to be required. The same self-evaluation, applied following the course, should reinforce the individual's appreciation of the amount of information gained during the seminar.

SEMINAR SCOPE

SPECIFIC NATURE OF THE NSWC MISSION

The major concern of NSWC, applicable to this seminar, is the development of digital systems having rather specific functions. Usually the product involves an embedded computer system supporting a larger function. These systems pose problems in validation and verification that are addressed through (1) software and hardware simulation or emulation, (2) instrumentation for monitoring performance without altering the environment, and (3) system testing.

NSWC is charged to develop systems that admit no errors; yet, the software design and creation processes do not permit such assurance with certainty. The axioms of reliability testing that are applicable to the testing of hardware do not extend to the software domain.

TOPICAL AREA APPROACH

The conical model suggests that senior executives should maintain a certain degree of technical knowledge in several fundamental areas. In practice, these areas can vary over time. Following this guide, the seminar is to be structured around a limited number of topical areas that are believed to be the most essential in conveying a sense of present computing technology and explaining potential future trends. Topical selection is also influenced by the specific nature of the Center's mission.

The following are believed to best define the appropriate technical base for NSWC senior executives at this point in time:

1. A Historical Development Integrating Hardware and Software Evolution, Tracing Through the Perceived Future Technology--The expansive use of computer systems is also a part of this historical treatment.
2. The Software Development Process--Included within this topical area are project planning, large-scale software project organization, software creation methodologies, and the role of software in the totality of system cost and performance.
3. Distributed Computing and Computer Networks--Examples used in this area should be selected from projects familiar to the participants (e.g., LAMPS, AEGIS, or SEAMOD).
4. The Regulatory Environment--Of emphasis in this topical area are the sources, nature, and extent of regulations affecting the acquisition of general-purpose computers and the development of tactical systems with embedded computers.
5. Information Support Systems for Management--Database systems technology, the implications of database support, the pervasive influence of data requirements on the efforts of NSWC, and the mechanisms for data security deserve special emphasis. The impact of computing technology on management productivity, often referred to as *office automation* or *word processing*, is included.

GLOBAL CONSIDERATION AND COORDINATION

A major difficulty in learning about computers is the jargon (i.e., the extensive and often confusing terminology). The use of a glossary, developed in parallel with the topical area material, is intended to reduce the acknowledged impedance caused by an alien vocabulary (or the appearance of familiar terms in an incomprehensible context). The developers of course material in each topical area should submit glossary contributions from that area in advance of the seminar so that the total list can be compiled to eliminate repetitions and disconcerting variations in definitions or usage.

The historical development area should identify *threads* that can be picked up in each of the following topical areas. These *threads* provide a natural introduction and establish some relations among the areas. For example, the first multiprocessor systems formed the basis for the future distribution of processing tasks. The historical treatment of the designated topical areas should not extend beyond the identification of *threads*, leaving further developments to that topical area.

When possible, handouts and summaries should be provided to the participants. Extensive note transcription is not advisable due to the amount and range of material to be covered. The use of visual displays and multiple media is encouraged insofar as the material presented can be captured or summarized without a major transcription effort by the participants.

PRESENTATION FORMAT

The presentation format prescribes three types of sessions, with questions developed within each topical area to increase the likelihood of realizing the differing objectives for each type of session:

1. A learning session devoted to the transmission of facts, opinions, perspectives, etc. (with questions designed to test knowledge for the self-evaluation purpose noted above or to assess the degree of learning)
2. A discussion session intended to expand on the factual presentation and to relate issues presented within a learning session or to explore perceived relationships among issues or perspectives arising in different sessions (open-ended questions stimulating individual opinion and collective discussion)
3. An implications session, which challenges the participants to consider the medium- to long-range implications for their particular area of responsibility at NSWC and for the entire Center (questions intended to stimulate reflection and introspection and to promote the sharing of personal biases)

Each day of the seminar is to include sessions of each type. The morning and afternoon sessions are allocated for learning and discussion, and the evening session is for implications.

RESOURCE PEOPLE SELECTION

The persons selected for presentations in the learning sessions are Dean Bernard A. Galler (Historical Development), Professor Howard L. Morgan (Information Support Systems for Management), Professor Philip H. Enslow, Jr. (Distributed Computing and Computer Networks), Dr. Barry W. Boehm (Software Development Process), Dr. John H. Manley (Regulatory Environment), and Mr. Frank A. Manola (Information Support Systems for Management). Scheduling difficulties can cause substitutions, and additional persons might be added both as presenters and discussants.

LOCATION AND TIMING

The seminar is to be held at the Airlie House near Warrenton, Virginia, beginning with lunch at approximately 12:00 noon on Monday, April 30, 1979. Lunch on Friday, May 4, will conclude the seminar. Excluding the initiating and concluding days (Monday and Friday), the timing of sessions is as follows:

Tuesday - Thursday

8:45 - 10:45	Learning Session
10:45 - 11:15	Morning Break
11:15 - 12:30	Discussion Session
12:30 - 2:00	Lunch
2:00 - 4:00	Learning Session
4:00 - 4:30	Afternoon Break
4:30 - 5:45	Discussion Session
5:45 - 7:30	Dinner
7:30 - 9:30	Implications Session

The topical areas to be treated during the Tuesday through Thursday period are the Software Development Process (Tuesday), the Regulatory Environment (Wednesday morning), Distributed Computing and Computer Networks (Wednesday afternoon), and Information Support Systems for Management (Thursday).

The initiating and terminating sessions will be as follows:

Monday

1:15 - 1:45	Logistics and Scheduling
1:45 - 3:15	Learning Session: Historical Development
3:15 - 3:45	Break
3:45 - 5:00	Learning Session: Historical Development
5:00 - 7:30	Dinner
7:30 - 9:30	Implications Session

Friday

8:45 - 10:45	Discussion and Implications Wrap-Up
10:45 - 11:15	Break
11:15 - 12:30	Seminar Critique
12:30 - ...	Lunch and Departure

SPECIFICATIONS FOR TOPICAL AREAS

The specification for each topical area follows. These specifications provide the primary information needed by each developer.

TOPICAL AREA SPECIFICATION

Topical Area: Historical Development of Computing Technology

Coordinators: Walter P. Warner and Richard E. Nance
(703)663-8807 (703)961-6931

Developer: Bernard A. Galler (313)764-0320

Learning Objectives: To give attendees

1. An understanding of modern computing technology through the discussion of events and developments that have had the most impact on today's technology
2. The *lead-ins* to the other areas to be emphasized within the seminar
3. The motivation for assessing future needs and applications of computing technology within their individual areas of responsibility and the Navy

Total Presentation Time: 2.75 hours

Additional Discussion Time: 2.00 hours

Subtopical Outline: (Major Subtopical Areas Only)

I. Past Implications

- A. One-of-a-kind machines
- B. Production models
- C. Programming languages
- D. Software development
- E. Minicomputers and microprocessors
- F. Memory technology
- G. Input/output technology
- H. Trends and applications

II. Current Technology and Future Trends

- A. Remote maintenance
- B. Large low-cost storages
- C. New I/O--graphical displays
- D. Continued decrease in size and cost?
- E. Decentralized and distributed processing
- F. Parallelism--the speed answer?

*References:

*Complete Topical Outline:

*Handouts:

*Lists of Questions:

1. Pre-Seminar Self-Evaluation--Related closely to the specific learning objectives listed under each topic and intended to give participants the ability to assess their prior knowledge of that area.
2. Group Discussion--Intended to promote interaction and the sharing of experiences, opinions, and biases.
3. Reflection and Introspection--Intended to focus the participants' attention on long-term issues related to the role of computing technology in their management responsibilities at NSWC.

*Glossary Contributions: (Terms With Definitions)

* These items (marked by an asterisk) are to be completed by the developer.

TOPICAL AREA SPECIFICATION

Topical Area: Software Development Process

Coordinators: Walter P. Warner and John H. Manley
(703)663-8807 (301)953-7100

Developer: Barry W. Boehm (213)535-2184

Learning Objectives: To give attendees

1. Sufficient technological background to enable them to assess software plans and progress as realistic and realizable
2. The recognition of the need for visibility of software
3. An understanding of the techniques for software development that provide realistic assessments of goals and progress

Total Presentation Time: 4.00 hours

Additional Discussion Time: 2.50 hours

Subtopical Outline: (Major Subtopical Areas Only)

- I. Planning and Organizing Software Development Projects Involving Software (45 minutes)
 - A. Software life cycle
 - B. Elements of a development plan
 - C. Estimating resource requirements
- II. The Software Creation Process (2 hours 30 minutes)
 - A. Requirements and specifications
 - B. Software design
 - C. Software development
 - D. Documentation
 - E. Testing, problems, and technology
 - F. Maintenance and modification, techniques that help
 - G. Emerging technology
- III. Techniques for Managing Software Projects (45 minutes)

*References:

*Complete Topical Outline:

*Handouts:

*Lists of Questions:

1. Pre-Seminar Self-Evaluation--Related closely to the specific learning objectives listed under each topic and intended to give participants the ability to assess their prior knowledge of that area.
2. Group Discussion--Intended to promote interaction and the sharing of experiences, opinions, and biases.
3. Reflection and Introspection--Intended to focus the participants' attention on long-term issues related to the role of computing technology in their management responsibilities at NSWC.

*Glossary Contributions: (Terms With Definitions)

* These items (marked by an asterisk) are to be completed by the developer.

TOPICAL AREA SPECIFICATION

Topical Area: The Regulatory Environment

Coordinators: John H. Manley and Walter P. Warner
(301)953-7100 (703)663-8807

Developer: John H. Manley (301)953-2944

Learning Objectives: To give attendees an increased understanding and appreciation for

1. The extreme complexity of the ADPE acquisition process
2. The benefits and problems inherent in tactical computer acquisition standards
3. The normal *disconnects* existing between technical and administrative processes
4. The myriad of conflicting constraints placed upon executive decision making by higher authority

Total Presentation Time: 2.00 hours

Additional Discussion Time: 1.25 hours

Subtopical Outline: (Major Subtopical Areas Only)

- I. The Life Cycle Process and Management Systems Models--A Framework
- II. ADP Versus ECS--Source of Conflict
- III. The ADPE Acquisition Process
- IV. The Tactical Computer Acquisition Process
- V. Conflicts and Loopholes
- VI. Hardware Versus Software--Additional Sources of Difficulty
- VII. Hardware Development Control Practices and the Application to Software
- VIII. Major Presidential Study Recommendations and Resolution of Regulatory Problems

*References:

*Complete Topical Outline:

*Handouts:

*Lists of Questions:

1. Pre-Seminar Self-Evaluation--Related closely to the specific learning objectives listed under each topic and intended to give participants the ability to assess their prior knowledge of that area.
2. Group Discussion--Intended to promote interaction and the sharing of experiences, opinions, and biases.
3. Reflection and Introspection--Intended to focus the participants' attention on long-term issues related to the role of computing technology in their management responsibilities at NSW.

*Glossary Contributions: (Terms With Definitions)

* These items (marked by an asterisk) are to be completed by the developer.

TOPICAL AREA SPECIFICATION

Topical Area: Distributed Computing and Computer Networks

Coordinators: Richard E. Nance and Walter P. Warner
(703)961-6931 (703)663-8807

Developer: Philip H. Enslow, Jr. (404)894-3187

Learning Objectives: To give attendees

1. An appreciation for the motivation for different types of distributed systems and networks
2. The ability to distinguish among distributed systems and computer networks according to topology, function, access, etc.
3. A recognition of the open technical questions and current major issues (e.g., global versus local control, security and protection, and resource decentralization versus centralized and integrated utility).

Total Presentation Time: 2.00 hours

Additional Discussion Time: 1.25 hours

Subtopical Outline: (Major Subtopical Areas Only)

I. The Distributed System

- A. Distributed processing
- B. Distributed databases
- C. Networks

II. Distributed Processing Systems

- A. Historical perspectives
- B. The distributive perspective
- C. The network distinction
- D. The distributed database

III. Computer Networks

- A. Motivation
- B. Topological classes
- C. Design considerations

IV. Distributed Database Systems

- A. Motivation
- B. Minicomputer influence
- C. Microprocessor influence

*References:

*Complete Topical Outline:

*Handouts:

*Lists of Questions:

1. Pre-Seminar Self-Evaluation--Related closely to the specific learning objectives listed under each topic and intended to give participants the ability to assess their prior knowledge of that area.
2. Group Discussion--Intended to promote interaction and the sharing of experiences, opinions, and biases.
3. Reflection and Introspection--Intended to focus the participants' attention on long-term issues related to the role of computing technology in their management responsibilities at NSWC.

*Glossary Contributions: (Terms With Definitions)

* These items (marked by an asterisk) are to be completed by the developer.

TOPICAL AREA SPECIFICATION

Topical Area: Information Support Systems for Management--Part I

Coordinator: Richard E. Nance (703)-961-6931

Developer: Howard L. Morgan (215)243-5000, Extension 7731

Learning Objectives: To give attendees

1. An acquaintance with the objectives of the different information support systems
2. The ability to distinguish among information support systems based on expressed or implied objectives
3. An accurate perception of the different types of support systems
4. An understanding of the difficulties and costs in developing and maintaining extensive, timely, and secure databases
5. An appreciation for the relations among database systems, word processing and office automation, and data security and protection

NOTE: These objectives apply to Parts I and II.

Total Presentation Time: 2.00 hours

Additional Discussion Time: 1.25 hours

Subtopical Outline: (Major Subtopical Areas Only)

- I. Objectives of ISS
 - A. Terminology
 - B. Needs objectives
 - C. Requirements objectives
 - D. Measurement concerns
- II. Historical Perspectives
 - A. Prior to 1964
 - B. The *family* (1964-68)
 - C. Vendor/CODASYL (1968---)
 - D. Database models
- III. Word Processing and Office Automation
- IV. Future Trends

*References:

*Complete Topical Outline:

*Handouts:

*Lists of Questions:

1. Pre-Seminar Self-Evaluation--Related closely to the specific learning objectives listed under each topic and intended to give participants the ability to assess their prior knowledge of that area.
2. Group Discussion--Intended to promote interaction and the sharing of experiences, opinions, and biases.
3. Reflection and Introspection--Intended to focus the participants' attention on long-term issues related to the role of computing technology in their management responsibilities at NSWC.

*Glossary Contributions: (Terms With Definitions)

* These items (marked by an asterisk) are to be completed by the developer.

TOPICAL AREA SPECIFICATION

Topical Area: Information Support Systems for Management--Part II

Coordinator: Richard E. Nance (703)961-6931

Developer: Frank A. Manola (617)491-3670

Learning Objectives: To give attendees

1. An acquaintance with the objectives of the different information support systems
2. The ability to distinguish among information support systems based on expressed or implied objectives
3. An accurate perception of the different types of support systems
4. An understanding of the difficulties and costs in developing and maintaining extensive, timely, and secure databases
5. An appreciation for the relations among database systems, word processing and office automation, and data security and protection

NOTE: These objectives apply to Parts I and II.

Total Presentation Time: 2.00 hours

Additional Discussion Time: 1.25 hours

Subtopical Outline: (Major Subtopical Areas Only)

- I. Development of a DBMS
 - A. Needs assessment
 - B. Requirements study
 - C. Data definition
 - D. Record composition
 - E. File organization
 - F. File maintenance
- II. Security and Protection
- III. Future Trends

*References:

*Complete Topical Outline:

*Handouts:

*Lists of Questions:

1. Pre-Seminar Self-Evaluation--Related closely to the specific learning objectives listed under each topic and intended to give participants the ability to assess their prior knowledge of that area.
2. Group Discussion--Intended to promote interaction and the sharing of experiences, opinions, and biases.
3. Reflection and Introspection--Intended to focus the participants' attention on long-term issues related to the role of computing technology in their management responsibilities at NSWC.

*Glossary Contributions: (Terms With Definitions)

* These items (marked by an asterisk) are to be completed by the developer.

APPENDIX A
PROFILES OF ATTENDEES



**PAUL L. ANDERSON, USN
CAPTAIN**

Commander
Naval Surface Weapons Center

Captain Paul Leland Anderson was born in Racine, Wisconsin. He joined the Navy in 1951 and was commissioned on 24 January 1952 upon graduation from Officer Candidate School. He holds a B.A. Degree in Chemistry from St. Olaf College, Minnesota, and a B.S. Degree in Electrical Engineering from the Naval Postgraduate School. His initial assignment after his commission was to USS GHERARDI (DMS-30) where he served as Gunnery Officer. His next duty was Executive Officer of the ocean minesweeper USS EXULTANT (MSO-441). In January 1957, he was assigned as Aide and Flag Lieutenant, Commander First Fleet, in San Diego, California. He then served in the office of the Chief of Naval Operations in Washington, DC as a Special Project Assistant in the General Planning Group.

From 1959 to 1961, he attended the Naval Postgraduate School in Monterey, California, for postgraduate study in Ordnance Engineering. After graduation he joined the guided missile cruiser USS TOPEKA (CLG-8) where he was assigned as Assistant Weapons Officer. He qualified for command of destroyers in 1964 while serving as Executive Officer, USS LYNDE MCCORMICK (DDG-8) in the Pacific.

From 1964 to 1966, Captain Anderson was assigned to the Naval Ordnance Missile Test Facility, White Sands Missile Range, New Mexico, where he served as Operations Officer and Test Officer. During this period, Captain Anderson was in charge of the consolidation of all land-based testing of Navy surface-to-air missiles at the White Sands facility. He next served as Weapons Officer of the guided missile cruiser USS LITTLE ROCK (CLG-4), Flagship of Commander Sixth Fleet homeported in Gaeta, Italy. Captain Anderson assumed command of the Pacific Fleet destroyer USS MANSFIELD on 3 February 1969 in Long Beach, California, and was awarded the Bronze Star for his service as Commanding Officer during the period from October 1969 to March 1970 when MANSFIELD was engaged in combat operations in Vietnam.

In October 1970, Captain Anderson reported to the AEGIS Project Office in Washington, DC. For his service as the AEGIS Weapon System Manager during at-sea testing from 1973 to 1975, he was awarded the Legion of Merit.

Captain Anderson commanded the Naval Weapons Station, Seal Beach, California, from December 1975 to July 1977. He became Commander, Naval Surface Weapons Center, on 15 September 1977.



JAMES E. COLVARD

Technical Director
Naval Surface Weapons Center

Mr. James E. Colvard is a native of Robbinsville, North Carolina. He graduated from Berea College, Kentucky, in 1958, with a B.A. Degree in Physics. He has subsequently done extensive graduate work in physics and electronics at UCLA, the University of Missouri, and Johns Hopkins University. His graduate work in the field of management includes studies at the University of Northern Colorado, the University of Southern California, and the University of Oklahoma. He received his Master's Degree in Public Administration from the University of Oklahoma in January 1973.

Mr. Colvard came to Dahlgren on 17 August 1969 from the Naval Weapons Center, China Lake, California. While at NWC he headed the Digital Fire Control Program, Range Operations Division, Project Engineering Division, and Countermeasures Division. In 1968, he received NWC's Michelson Lab Fellowship Award for Management. He was employed by the Naval Weapons Laboratory to head the Advanced Systems Department and served in that capacity until September 1971. As part of NWL's rotational system, he then went to the Surface Warfare Department and served as its head until he was appointed Assistant Technical Director in September 1972. He was serving in that capacity until his selection as Technical Director of the Naval Weapons Laboratory in July 1973. Mr. Colvard was named Technical Director of the Naval Surface Weapons Center upon its establishment in September 1974.

Mr. Colvard received the Navy Distinguished Civilian Service Award on 7 April 1977 in recognition for outstanding and distinguished service to the United States Navy as the Technical Director for the Naval Surface Weapons Center.



CAPTAIN Z. L. NEWCOMB

Deputy Commander
Naval Surface Weapons Center

Captain Newcomb was born in Roanoke, Virginia. He received his commission upon graduation from the Aviation Officer Candidate Program in Pensacola, Florida, in January 1957. He holds a B.S. Degree in mathematics from Roanoke College, Salem, and an M.S. Degree in operations analysis from the U.S. Naval Postgraduate School.

He has served on USS RANGER (CVA-61) as Assistant Navigator, USS FOX (CG-33) as Operations Officer, USS JOUETT (CG-29) as Executive Officer, and USS JOSEPH HEWES (FF-1078) as Commanding Officer.

Captain Newcomb's earlier duties included service in a Patrol Aircraft Squadron in Norfolk, Virginia, as Aerial Navigator and Assistant Intelligence Officer/Photo Officer. He also served as Aerial Navigator on Project Magnet in Norfolk and later at Patuxent River, Maryland. From July 1966 until July 1968, he served as a Warfare Analyst in the Systems Analysis Division of the Office of the Chief of Naval Operations (OP-96).

Captain Newcomb has received ashore training at the U.S. Naval Postgraduate School, Monterey, California; Destroyer Department Head School, Newport, Rhode Island; and the Naval War College, Newport, Rhode Island. From July 1973 to June 1975, he was a Faculty Member at the Naval War College.

Captain Newcomb first came to Dahlgren, Virginia, in January 1961 as Command Control Center Officer, Naval Space Surveillance System. He returned to NSWC, Dahlgren, in September 1977 and was serving as Operations/Ordnance Officer until his appointment to Deputy Commander on 16 June 1978.



JAMES H. MILLS, JR.

*Deputy Technical Director
(Operations)*

B.S. in Pub Admin, U of Nor CO, 1972; undergrad work, U of OK and the U of VA. USAF, 1950-1954. At NSWC/DL since 1964. Superior Civilian Ser Award in 1968 for work in EW; John Adolphus Dahlgren Award for Management and Eng. 1972. Hd, EM Systems Div, 1969-1970, and Guidance and Control Division, 1970-1971; Assist Hd of Tech App, 1971-1972; Hd, Product Engineering Division, 1972; Hd, Test and Eval Dept, 1972; Hd, Eng Dept, 1972-1974; Hd, Electronics Systems Dept, 1974-1976; Assoc Tech Dir, 19 July 1976 - 31 Jan 1977; Hd, Combat Sys Integration Dept, 1977. Appointed Deputy Technical Director (Operations) 1 Jan 1978.



DAVID B. COLBY

Associate Technical Director
(Evaluation)

B.S. Phys/Math, Bates Col, 1958; M.A. Phys, Wesleyan U, 1960; also U of OK, NTL-IABS, ICAF, U of Nor CO, FEI, DSMC NWL, 1961; Hd EMC Br, 1964-1967; Navy MCS Award, 1966; Navy, NRL and APL/JHU, 1967-1969 (missile defense); NWL, Hd EM System Div, 1968; CNO OP-96, 1968 (anti-ship warfare); Asst/Assoc Hd Advanced Systems Dept, 1969-1970; MCDEC Quantico, 1970 (long-range planning); CNO OP-03E/093, 1971 (tactical EM prog); NWL Rqmts Staff, 1971 (sys studies); DNL (EM Warfare, 1966-1970, special warfare, 1968-1971, fleet defense, 1970-1971). Dep Dir Off of Telecom Policy, Exec Off of President, Wash, DC, 1972-1973; NWL, Hd Rqmts Staff, 1974-1975 (surface warfare plans and prog); NSWC, Hd Combat Sys Integr. Dept, 1975-1976; Accoc Tech Dir (Dahlgren) 1977; currently Assoc Tech Dir (Evaluation).

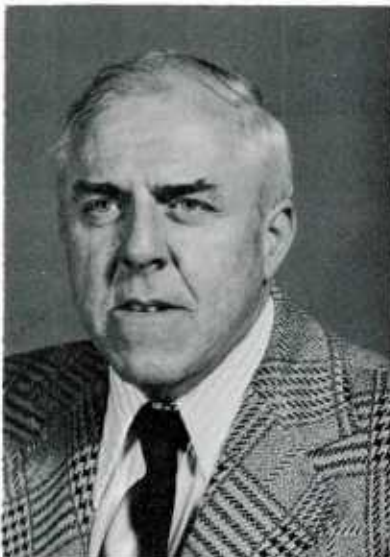


DONALD N. DICK
Head, Advance Planning Staff

B.S. in Electrical Engineering, Drexel Institute of Technology, 1958; M.S. in Electrical Engineering, Drexel; 1962. Senior Project Engineer in Ship Instrumentation and Control Systems, DTNSRDC, Annapolis Division, 1958-1965. Member Technical Staff in Strategic and Tactical Command, Control Communication Systems, MITRE Corp., 1965-1967. At NSWC/WOL, Advanced Planning and Analysis Staff, since 1967. Currently Head, Advanced Planning Staff.

ENGINEERING DEPARTMENT (CODE E)

Provides engineering support for the development of surface weapon systems and subsystems. Participates in the planning and execution of Center research, development, design and evaluation programs. Provides planning for procurement of technical data. Establishes environmental criteria and requirements for the design of weapons. Performs environmental testing and assessment to ensure satisfaction of requirements. Develops, maintains, administers and operates the Explosive Experimental Area and major test facilities. Conducts exploratory, advanced, and engineering development for the Navy's Magnetic Silencing Program. Responsible for Product Assurance product engineering and ILS of Center RDT&E programs; responsible for the completeness, adequacy, and accuracy of the Technical Data Package. Provides transition-to-production planning. Responsible for Fleet technical manuals and the Center's overall publications programs. Provides engineering assistance on production contracts. Provides photographic services and photoelectric optical support. Performs or contracts for fabrication of hardware items and experimental and engineering models to support RDT&E and in response to urgent fleet needs. Provides technical activity offices for Magnetic Silencing, Fleet Engineering Support, preservation/packaging and provides transition-to-production for Decoy Acquisition. Provides metrological, gaging and engineering standards services.



WENDELL L. ANDERSON, Head
Engineering Department

B.S. in Chemical Engineering, PA State University, 1944; graduate work, PA State, University of MD, University of VA. Branch Head, Naval Research Laboratory, 1944-1971. Head, Chemical and Biological Sciences Division, 1971-1973. Head, Advanced Systems Department, 1973-1974. Head, Test and Evaluation Department, 1974-1977. Currently Head, Engineering Department. Technical Consultant ERDA, FTC, and EPA. Krotel Award, Stuttgart, Germany. Current interests: Aerosol Physics, Chemical and Biological Sciences, and Physical and Environmental Testing.

ELECTRONICS SYSTEMS DEPARTMENT (CODE F)

Conducts and manages research, development, analysis, and evaluation programs in electronics and electromagnetics, including electronic warfare, electromagnetic and nuclear effects, pulse power and directed energy, intelligence processing systems, radar and other electromagnetic systems and related products. Provides a technology base and a source of fleet and center support in the above and other areas of electronics and electromagnetics.



ROBERT T. RYLAND, JR.

Head

Electronics Systems Department

Attended University of Richmond, 1947-1949; S.B. in Electrical Engineering, MIT, 1951; part-time graduate studies in Electrical Engineering at University of Pittsburgh and in Management at American U., Northern CO, and University of VA. Transformer Design Engineer, Westinghouse, 1951-1954. At NSWC, Dahlgren, since 1954; various positions in computer hardware design and computer center management, 1954-1968; senior management positions in several NSWC, Dahlgren, departments and the Technical Director's Staff, 1968 to present; currently Head, Electronics Systems Department.

WEAPONS SYSTEMS DEPARTMENT (CODE G)

Conducts analysis, research and development and evaluation in the areas of Naval surface warfare, surface-launched weapon systems, Marine Corps weapon systems, and the chemical and biological sciences. Proposes and appraises the direction and magnitude of potential improvement in surface Naval weaponry. Through research and exploratory development invents improved weaponry and develops systems to exploit those improvements. Analyzes system and component designs, performance, and malfunctions and provides in-service engineering and related fleet support services. Develops and applies supporting technology in the areas of environmental enhancement, energy conversion, materials and engineering mechanic sciences. Has lead lab responsibility in areas of CIWS, CW/BR, armor materials and survivability of Navy combat and weapon systems. Provides engineering development and technology in the area of Navy's supervisor of diving and salvage. Develops, manages and operates the Dahlgren ranges and major test facilities, including operation of surveillance radars and tracking complex and meteorological systems. Provides Navy-wide liaison and consultation in test and evaluation efforts and environmental simulation.



LEMMUEL L. HILL, *Head*
Weapons Systems Department

B.S. in Physics, Rensselaer Polytechnic Institute, 1959; Ph.D. in Physics (Nuclear Theory), the Catholic University of America, 1967. U.S. Navy, 1950-1955. At NSWC/WOL since 1959; Aerophysics work in shock tube, shock-tube wind tunnels, and ballistics ranges until 1968; Head, Nuclear Physics Branch until 1973; Acting Head, Physics Research Division until 1974; Assistant to Department Head, Underwater Weapons Department for 7 months; Science Advisor to COMNAVSURFLANT in NORVA until 1975; Head, Radiation Division until 1976; Head, Research and Technology Department, 1976-1979; currently Head, Weapons Systems Department.

STRATEGIC SYSTEMS DEPARTMENT (CODE K)

Conducts theoretical and engineering analyses and development in support of the Center's strategic mission. Develops operational aiming data and software for the Navy's strategic weapons. Provides support in area of aerodynamics including ground test facilities. Develops digital intelligence processing systems. Serves as central source for satellite geodesy with responsibility for software development and orbit computations for satellite systems and precise geodetic positioning. Is the primary Navy Center for providing technical support for the exterior ballistics of air- and surface-launched unguided and terminally guided Navy weapons. Manages and operates the central computing facilities for the Center.



RAYMOND H. HUGHEY, JR.
Strategic Systems Department

Supvy Physicist. B.S. in Physics, University of AL, 1958; graduate studies in physics and math, University of KT and American University. Guidance and fire control analysis, trajectory simulation for POLARIS, POSEIDON, and TRIDENT since 1959. At NSWC, White Oak since 1959. Head, FBM Geoballistics Division, 1969 - 1978. Currently Deputy Head of K Dept.

COMPTROLLER DEPARTMENT (CODE M)

Advises and assists the Commander, Technical Director, and all levels of management in: (1) planning, directing, and executing financial and management operations; (2) developing actions and policies to promote economy and efficiency in the use of Center resources; and (3) establishing and maintaining an integrated system of financial management.



HAL D. SHIELDS
Comptroller

B.A. in Political Science, Wittenberg University, 1956; M.P.A. in Public Administration, University of Michigan, 1960; M.A. in Economics, American University, 1965. At BuWeps, 1960-1965, as a Program Analyst for Assistant Chief for RDT&E; NUSC, Newport, 1965-1967, as Assistant Comptroller; NASA, 1968, as Program Analyst for Manned Space Flight Program; NADC, Warminster, 1968-1973 as Financial Manager; NWL, Dahlgren, 1973-1974, as Comptroller; NSWC, Dahlgren, Head, Central Staff, 1974-1978. Currently Comptroller.

COMBAT SYSTEMS DEPARTMENT (CODE N)

Provides broad planning, analysis, management and technical support to the acquisition of Navy combat systems and weapon control systems. Provides lead laboratory support to the AEGIS Shipbuilding Project and the Anti-Ship Missile Defense Project. Serves as primary technical agent and data repository for Navy weapon system safety. Directs planning, and RDT&E necessary to carry out department roles.

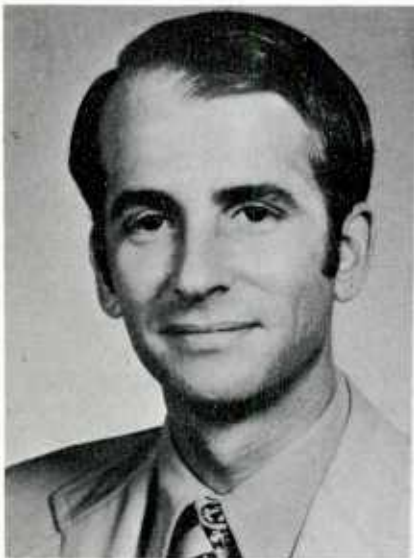


GERALD O. MILLER, Head
Combat Systems Department

B.S. in Electrical Engineering, University of MO, 1958. Advanced Electrical Engineering and Public Administration at USC and UCLA. Employed at NWC, China Lake, for 17 years. Last assignments at China Lake included Associate and Acting Head, Weapons Department and Program Manager for Anti-ship Weapon System efforts at NWC. Transferred to NSWC, White Oak in January 1976 as Head, Advanced Weapons Department. Currently Head, Combat Systems Department.

PERSONNEL MANAGEMENT STAFF (CODE P)

Directs the civilian personnel management program for the Center and its tenant activities. Responsible for the overall administration of the program in all functional areas including staffing, classification, position management and organization analysis, manpower planning and utilization, employee and management development, labor-management relations, management representation, employee relations and services, and manpower information. Responsible for the establishment of uniform policies to meet Center requirements while providing appropriate program variation to meet special local needs.



LEONARD R. KLEIN
Personnel Director

B.S. in Industrial Management, Gannon College; graduate studies in personnel administration at George Washington University. He began his professional career with the Pennsylvania State Civil Service Commission, Harrisburg. Among his successive appointments have been the Naval Supply Depot, Mechanicsburg, PA; the Naval Ordnance Station, Indian Head, MD; Head, Wage and Classification, the National Naval Medical Center, and the Area Wage and Classification Office, Washington, DC; various assignments in the Office of Civilian Manpower Managements, 1966-1972; Civilian Personnel Director, U.S. Naval Oceanographic Office, 1972-1974; Personnel Director, former Naval Ordnance Laboratory, 1974. Currently, Personnel Director, Personnel Management Staff.

RESEARCH AND TECHNOLOGY DEPARTMENT (CODE R)

Conducts research in ordnance technology, including investigations of natural phenomena that directly or indirectly could influence the design or performance of surface weapons or strategic systems. Conducts exploratory development in ordnance technology, particularly the application of new principles and phenomena revealed through its research and the research of others to solve the Navy's problems in the development and use of surface weapons' and strategic systems. Provides consultative and participatory assistance to other elements of the Naval Surface Weapons Center, the Navy's Material and Systems Commands, the Department of Defense, and other government agencies in solving problems in Ordnance Technology and in areas where its expertise in ordnance technology can be appropriately applied.



JOSEPH S. di RENDE, Head
Research and Technology Department

B.S. in Mech Eng, Newark College of Eng, 1942; Master of Eng, Yale U, 1944; Doctor of Eng, Yale U, 1949. Assoc Tech Dir and Hd, Air and Surface Weapons Development, NOL, 1966-1974; Tech Dir, Aeronautical Turbine Lab, Trenton, NJ, 1962-1966; Physical Science Admin, Dir of Research and Scientific Dir, Army Transportation and Research Command, Fort Eustis, VA. Eight years of graduate and undergraduate teaching experience in thermodynamics, machine design, mechanical vibration, kinematics, and mechanical technology at the U of DE and Yale U. Hd, Eng Dept. Currently Head, Research and Technology Department.

SUPPLY DEPARTMENT (CODE S)

Responsible for planning, organizing, coordinating, controlling, and managing all supply functions including contracting, stock control, material, Navy Industrial Fund inventories, operation of the Enlisted Dining Facility, stock point for Naval gun barrels and related assemblies, and personal property movements for military personnel. Develops, implements, and administers Center supply policy, provides primary supply policy counsel to the Commander, and is primary representative in all supply functions relating to external organizations. Provides procurement policy and technical procurement guidance to NAVSURFWPNCEN Field Facilities.



JERRY W. SHAW, USN, CDR
Supply Officer

B.A. in Business Administration, University of Texas, 1959; MBA program on Government Contracts, George Washington University, 1969. Contracting in Major Weapons Systems Acquisition, Naval Ordnance Systems Command Headquarters, 1969-1972; Purchase and Senior Navy Contracting Officer, Navy Supply Depot, Yokosuka, Japan, 1972-1976; currently, Supply Officer, NSWC, Dahlgren.

UNDERWATER SYSTEMS DEPARTMENT (CODE U)

Conducts exploratory, advanced, and engineering development of weapon systems, subsystems, and components to meet Navy needs for attacking surface and subsurface targets. Conducts the necessary analyses, simulation, tests, and evaluation and provides production and fleet support of the above. Develops, operates, and maintains field and specialized technical facilities to support the RDT&E process. Product lines include: Static and propelled mines, torpedoes, torpedo destruct weapons, subsonic and supersonic underkeel missiles, torpedo payload missiles, Arctic, airborne and surface ASW systems, Marine support weapons, swimmer weapon systems, and the necessary search and localization sensors, fire control systems, launchers, and specialized test equipments to support these weapons.



EUGENE H. BEACH, Head
Underwater Systems Department

B.S. in Electrical Engineering, University of MI, 1941; M.S. in Physics, University of MI, 1947; Ph.D. in Physics, University of MI, 1953. At NOL 1941 to 1944; Ensign, USN, 1944-1945; at NOL and NSWC, White Oak since 1953. Served as Chief, Magnetics Influence Branch; Chief, Underwater Electrical Engineering Department; Associate Head, Underwater Weapons Development; and Head, Ordnance Systems Development Department. Associate Technical Director, White Oak Laboratory. Currently Head, Underwater Systems Department.

PUBLIC WORKS DEPARTMENT (CODE W)

Plans, designs, maintains and repairs public works and public utilities, and performs minor construction work. Operates the Center utility systems. Maintains all automotive, construction, railroad, and materials and weight handling equipment and operates all such equipment not assigned to other Center departments. Prepares engineering plans and justifications for public works projects and exercises surveillance over design work for the Center performed by private firms. Administers maintenance and special project funds assigned to the department and budgets for future requirements. Performs all Center housing functions. Provides entomological and related pest control services. Assures the safe operating condition of pressure vessels and materials and weight handling equipment. Trains and examines vehicle and equipment operators and issues permits.

The Public Works Officer has collateral duty as Resident Officer in Charge of Construction for projects in excess of \$50,000 and Officer in Charge of Construction up to \$50,000.

Responsible for the initiation, direction and coordination of all action necessary to plan and carry out an effective energy conservation and environmental protection program for the Center.

D. W. HARNED, USN, CDR,
Public Works Officer



B.S. in Civil Engineering, Speed Scientific School, University of Louisville, 1958; NROTC Commission as Ensign, U.S. Navy, Aug 1958; M.S. in Civil Engineering, University of Washington, 1964. Received the Navy Commendation Medal for his work as Planning and Design Coordination Officer while serving in the Republic of Vietnam and wears two Meritorious Unit Commendations awarded to the OIC of Construction, RVN, for its contribution to the defense of Southeast Asia. Member American Society of Civil Engineers, American Public Works Association, and associate member Society of the Sigma Xi. Assistant Fire Control Officer, USS BREMERTON (CA-130), 1958-1960; Gunnery Assistant, USS TOWERS (DDG-9), 1960-1962; transferred to the Navy's Civil Engineer Corps, 1963. Assistant Shops Engineer, Public Works Department, U.S. Training Center, Great Lakes, Illinois, 1964-1965; Planning Officer, U.S. Navy Public Works Center, Great Lakes, 1965; Design Coordination Officer, OIC of Construction, Republic of Vietnam, 1966-1967; Head, Management Department, Head, Acquisition Department, Head, Planning Department, East Central Division, Naval Facilities Engineering Command, Philadelphia Naval Base, 1967-1971; Exec. Officer, Navy's Public Works Center, Yokosuka, Japan, 1971-1975; Public Works Officer, Submarine Base, New London, 1975-1978; currently Public Works Officer, NSWC.

COMMAND SUPPORT DEPARTMENT (CODE X)

Acts for the Commander in overall general administrative activities of the Center. Provides Command support services, military affairs, security, safety program, fire prevention and protection. Conducts programs in public affairs, community relations and special services and operates associated facilities. Provides official mail services, and central files. Operates the general and technical libraries and elementary school. Provides and maintains communication facilities, equipment and service, including Navy teletype and ground electronics systems. Operates an outlying airfield. Administers bachelor officer and enlisted quarters, and commissioned officer and enlisted clubs. Maintains masterfile of mobilization, disaster control, and similar documents. Coordinates the allocation and utilization of space and facilities, and administers the Center Zone Inspection Program.



ALBERT L. PITTS, Head
Command Support Department

B.A. in Public Administration, University of Northern Colorado, 1971; graduate study with University of Northern Colorado and University of Virginia. At NSWC since 1954; in Management Engineering, 1959-1969; Assistant to Department Head, Advanced Systems Department, 1969-1974; Deputy Head, Administrative Services Department, 1974-1977. Currently, Head, Command Support Department.

APPENDIX B
ADDRESSES OF SEMINAR PERSONNEL

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Commanding Officer
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Attn: Training Office

Commanding Officer
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Commanding Officer
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Attn: Training Office

Commanding Officer
Naval Personnel Research & Development Center
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Attn: Training Office

Director
Naval Research Laboratory
Washington, DC 20375
Attn: Training Office

Commanding Officer
Naval Ship Weapon System Engineering Station
Port Hueneme, CA 93043
Attn: Training Office

Commanding Officer
Naval Underwater System Center
New London, CT 06320
Attn: Training Office

Commander
Naval Weapons Center
China Lake, CA 93555
Attn: Training Office

Commander
Pacific Missile Test Center
Point Mugu, CA 93041
Attn: Training Office

Defense Documentation Center
Cameron Station
Alexandria, VA 22314 (12)

Library of Congress
Washington, DC 20540
Attn: Gift & Exchange Division (4)

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